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FOREIGN TECHNOLOGY DIVISION

BREAKDOWN OF POLYETHYLENE FILM IN A GAS DISCHARGE, DIRECTED PERPENDICULAR TO AND IN PARALLEL WITH THE SURFACE OF THE FILM

by

S.N. Koykov, V.A. Fomin

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By: S.N. Koykov, V.A. Fomin

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Block	Italic	Transliteration	Block	Italic	Transliteration
А а	*А а*	A, a	Р р	*Р р*	R, r
Б б	*Б б*	B, b	С с	*С с*	S, s
В в	*В в*	V, v	Т т	*Т т*	T, t
Г г	*Г г*	G, g	У у	*У у*	U, u
Д д	*Д д*	D, d	Ф ф	*Ф ф*	F, f
Е е	*Е е*	Ye, ye; E, e*	Х х	*Х х*	Kh, kh
Ж ж	*Ж ж*	Zh, zh	Ц ц	*Ц ц*	Ts, ts
З з	*З з*	Z, z	Ч ч	*Ч ч*	Ch, ch
И и	*И и*	I, i	Ш ш	*Ш ш*	Sh, sh
Й й	*Й й*	Y, y	Щ щ	*Щ щ*	Shch, shch
К к	*К к*	K, k	Ъ ъ	*Ъ ъ*	"
Л л	*Л л*	L, l	Ы ы	*Ы ы*	Y, y
М м	*М м*	M, m	Ь ь	*Ь ь*	'
Н н	*Н н*	N, n	Э э	*Э э*	E, e
О о	*О о*	O, o	Ю ю	*Ю ю*	Yu, yu
П п	*П п*	P, p	Я я	*Я я*	Ya, ya

*ye initially, after vowels, and after ъ, ь; e elsewnere.
When written as ё in Russian, transliterate as yё or ё.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh^{-1}
cos	cos	ch	cosh	arc ch	cosh^{-1}
tg	tan	th	tanh	arc th	tanh^{-1}
ctg	cot	cth	coth	arc cth	coth^{-1}
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

GRAPHICS DISCLAIMER

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BREAKDOWN OF POLYETHYLENE FILM IN A GAS DISCHARGE, DIRECTED PERPENDICULAR TO AND IN PARALLEL WITH THE SURFACE OF THE FILM

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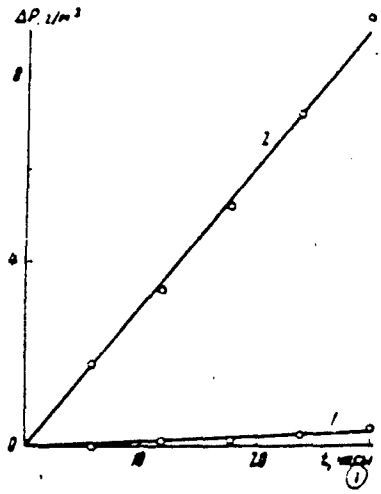
Submitted 22 Mar 1968

It was shown in work [1] that a significant breakdown of polymer films under the action of a gas discharge, accompanied by a considerable lessening of thickness, weight and breakdown voltage, with the course of time takes place only under the direct action of the discharges with a sufficient quantity of oxygen present. Only two hypotheses on the causes of erosion of polymer films, i.e., their breakdown under the action of discharges, agree with these data [1]:

a) oxidation of the polymer films to low-molecular compounds as a result of reactions with atomic oxygen or other unstable and highly active products of the gas discharge [2];

b) oxidation of polymer films to low-molecular compounds as a result of the development of macroradicals in the polymer due to electron or ion bombardment with the subsequent chain reaction of these macroradicals with the oxygen [3].

For the purpose of clarifying which of these two hypotheses is more suitable for explaining the causes of erosion of polymer films, we carried out the following experiment (drawing). The gas discharge originated in the gap between glass plates, to the outer surface of which metallic electrodes were attached for supplying high voltage with a frequency of 50 Hz, maintaining the discharge.



Lessening of weight ΔP of a polyethylene film in a calculation per unit of area of the surface of the film depending on the time t of influence of the discharges in the gas interlayer with a thickness of 3.5 mm between glass plates 2.65 mm thick with a voltage of 18 kV: 1 - surface of the film in parallel with; 2 - perpendicular to the discharges.

Key: (1) hours.

In the space enveloped by the discharge two samples of polyethylene film were placed: one sample was found on the glass plate in such a way that the gas discharge was directed perpendicular to the surface of the film, and the other sample in the form of a long narrow strip was stretched on a special frame and was situated in such a way that the discharges were directed in parallel with the surface of the film. Evidently bombardment of the surface of the polymer with electrons and ions can have significant value only in the first case, whereas the interaction with unstable products of the gas discharge should take place to the same measure in both cases.

Conclusions

It was revealed that the rate of erosion, determined based on the lessening of weight with the course of time of the tests, in the

first case turns out to be many times greater (30 times and more) than in the second. Consequently, significant erosion of a polyethylene film under the action of a gas discharge is possible only in the case when the discharge is directed perpendicular to the surface of the film (or in other words there is a component of the electric field which is normal to the film). This means that the most probable is hypothesis b), taking into account the role of electron or ion bombardment of the surface of the polymer.

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3. H. Hougen, Nature, 188, 577, 1958.